

PATENT ABSTRACTS OF JAPAN

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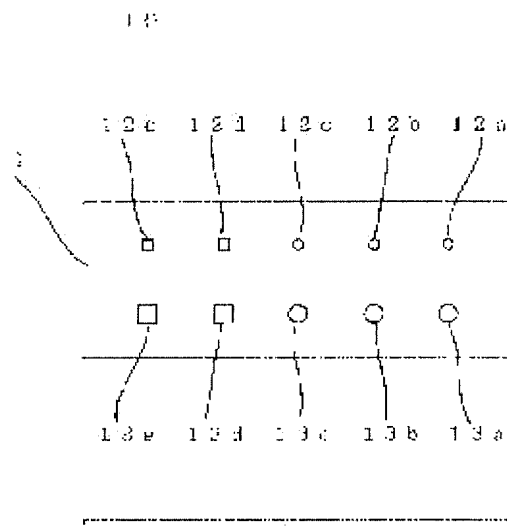
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(54) CALIBRATION METHOD FOR SENSITIVITY OF X-RAY FOREIGN MATTER INSPECTION APPARATUS AND FOREIGN MATTER SAMPLE BODY FOR SENSITIVITY CALIBRATION

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a calibration method which enables a sensitivity calibration operation of an X-ray foreign matter inspection apparatus efficiently and to provide a foreign matter sample body for sensitivity calibration.

SOLUTION: The calibration method for the sensitivity of the X-ray foreign matter inspection apparatus which detects foreign matter contained in a specimen by transmitted X-rays enables the use of the foreign matter sample body which is provided integrally with a foreign matter sample having a first volume and a foreign matter sample having a second volume as one set to irradiate the specimen to which the foreign matter sample body is added with X-rays. The sensitivity of the X-ray foreign matter inspection apparatus is calibrated by a foreign matter detection signal, with reference to the foreign matter samples having the different volumes, which is output based on image data on its transmitted X-ray image.



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CLAIMS

[Claim(s)]

[Claim 1]In a sensitivity calibration method of an X ray contamination inspection apparatus which detects a foreign matter contained in an inspected thing with transmission X ray, With a foreign-matter-detection signal over said foreign matter sample which carries out X-ray irradiation to a foreign matter sample object which it had in one, and is outputted based on image data of the transmission X ray image by making into a lot a foreign matter sample which has the first capacity, and a foreign matter sample which has the second capacity. A sensitivity calibration method of an X ray contamination inspection apparatus performing a sensitivity calibration of said X ray contamination inspection apparatus.

[Claim 2]In a sensitivity calibration method of an X ray contamination inspection apparatus which detects a foreign matter contained in an inspected thing with transmission X ray, As opposed to a foreign matter sample object which made a lot a foreign matter sample which has the first capacity, respectively, and a foreign matter sample which has the second capacity and which was provided with two or more groups based on two or more foreign matter samples still in one, A sensitivity calibration method of an X ray contamination inspection apparatus characterized by performing a sensitivity calibration of said X ray contamination inspection apparatus with a foreign-matter-detection signal over a foreign matter sample of two or more of said groups which carries out X-ray irradiation and is outputted based on image data of the transmission X ray image.

[Claim 3]So that a foreign matter sample which has the first capacity may be detected as a foreign matter in a group of a foreign matter sample with which said foreign matter sample object was equipped and a foreign matter sample which has the second capacity may not be detected as a foreign matter, A sensitivity calibration method of claim 1 performing a sensitivity calibration of said X ray contamination inspection apparatus, and the X ray contamination inspection apparatus according to claim 2.

[Claim 4]A foreign matter sample object for sensitivity calibrations of an X ray contamination inspection apparatus making into a lot a foreign matter sample which has the first capacity, and a foreign matter sample which has the second capacity, and having it in one with transmission X ray in a foreign matter sample object for sensitivity calibrations of an X ray contamination inspection apparatus which detects a foreign matter contained in an inspected thing.

[Claim 5]In a foreign matter sample object for sensitivity calibrations of an X ray contamination inspection apparatus which detects a foreign matter contained in an inspected thing with transmission X ray, A foreign matter sample object for sensitivity calibrations of an X ray contamination inspection apparatus having a foreign matter sample of two or more groups depended on two or more foreign matter samples by making into a lot a foreign matter sample which has the first capacity, and a foreign matter sample which has the second capacity still in one.

[Claim 6]So that a foreign matter sample which has the first capacity may be detected as a foreign matter in a group of a foreign matter sample with which said foreign matter sample object was equipped and a foreign matter sample which has the second capacity may not be detected as a foreign matter, Claim 4 choosing said first and the second capacity and a foreign matter

sample object for sensitivity calibrations of the X ray contamination inspection apparatus according to claim 5.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the sensitivity calibration method of the X ray contamination inspection apparatus which detects the foreign matter contained in an inspected thing by detection of transmission X ray, and said foreign matter sample object for sensitivity calibrations.

[0002]

[Description of the Prior Art]The X ray contamination inspection apparatus is used for detection of the foreign matters (metal, a stone, glass, a synthetic resin, a bone, rubber, etc.) contained in foodstuffs or drugs from the former. X-rays are irradiated with said X ray contamination inspection apparatus by the inspected thing, and the foreign matter contained in said inspected thing is detected based on the image data of the transmission X ray. It is performing eliminating said X ray contamination inspection apparatus from a conveying machine, if the foreign matter which can detect the transmission image of the inspected thing on a conveying machine, and is contained in said inspected thing by having a line sensor is detected.

[0003]The conventional X ray contamination inspection apparatus picturizes the X-rays which penetrated the inspected thing on a conveying machine, for example with a line sensor, and foreign matter detection is performed by performing comparison test processing with a threshold based on the image data obtained by said image pick-up. The sensitivity calibration is performed a priori to the dust particle inspection of an inspected thing. As the method of this sensitivity calibration, said X ray contamination inspection apparatus has the method of performing automatically the sensitivity calibration of an X ray contamination inspection apparatus through an inspected thing, and a method of performing the sensitivity calibration of an X ray contamination inspection apparatus to said X ray contamination inspection apparatus manually through the inspected thing which mixed the foreign matter sample. Two or more inspected things in which two or more foreign matter samples were made to mix as a manual method using a foreign matter sample are prepared, it lets this inspected thing pass to an X ray contamination inspection apparatus for said two or more inspected things of every, and the sensitivity calibration is performed each time. In said X ray contamination inspection apparatus, change of foreign-matter-detection sensitivity sometimes arises [change of the amount of X-ray irradiation, in addition] more while in use. Then, in the middle of condition of use, it lets the inspected thing which mixed the foreign matter sample pass to an X ray contamination inspection apparatus, and the sensitivity calibration is performed.

[0004]

[Problem(s) to be Solved by the Invention]As mentioned above, in the conventional X ray contamination inspection apparatus. Since it is necessary to let what mixed the foreign matter sample in the inspected thing for every foreign matter sample pass to an X ray contamination inspection apparatus, and to perform a sensitivity calibration a use front and in the middle of use each time when performing a sensitivity calibration manually using a foreign matter sample, While proofreading work takes time and effort, time needs and there is a problem that efficient proofreading work cannot be performed.

[0005]Then, this invention solves the problem of such conventional technology, and an object of this invention is to provide the foreign matter sample object for sensitivity calibrations to the proofreading method that the sensitivity calibration work of the X ray contamination inspection apparatus using a foreign matter sample can be done efficiently.

[0006]

[Means for Solving the Problem]In a sensitivity calibration method of an X ray contamination inspection apparatus which detects a foreign matter contained in an inspected thing with transmission X ray, With a foreign-matter-detection signal over said foreign matter sample which carries out X-ray irradiation to a foreign matter sample object which it had in one, and is outputted based on image data of the transmission X ray image by making into a lot a foreign matter sample which has the first capacity, and a foreign matter sample which has the second capacity. A sensitivity calibration of said X ray contamination inspection apparatus is performed (claim 1).

[0007]Dust particle inspection can be simultaneously conducted by this to a foreign matter sample of a lot which has two kinds of different capacity, a sensitivity calibration of said X ray contamination inspection apparatus can be performed based on a foreign-matter-detection result for said every sample, and it is possible to perform a sensitivity calibration efficiently.

[0008]And in a sensitivity calibration method of an X ray contamination inspection apparatus which detects a foreign matter contained in an inspected thing with transmission X ray, As opposed to a foreign matter sample object which made a lot a foreign matter sample which has the first capacity, respectively, and a foreign matter sample which has the second capacity and which was provided with two or more groups based on two or more foreign matter samples still in one, A foreign-matter-detection signal over a foreign matter sample of two or more of said groups which carries out X-ray irradiation and is outputted based on image data of the transmission X ray image performs a sensitivity calibration of said X ray contamination inspection apparatus (claim 2).

[0009]. By this, made into a lot a foreign matter sample which has two more kinds of different capacity. Dust particle inspection of two or more groups depended on two or more foreign matter samples can be conducted simultaneously, a sensitivity calibration of said X ray contamination inspection apparatus can be performed based on a foreign-matter-detection result for every sample of two or more of said groups, and it is possible to perform a sensitivity calibration more efficiently.

[0010]And in a group of a foreign matter sample with which said foreign matter sample object was equipped about a sensitivity calibration method of claim 1 and the X ray contamination inspection apparatus according to claim 2, A sensitivity calibration of said X ray contamination inspection apparatus is performed so that a foreign matter sample which has the first capacity may be detected as a foreign matter and a foreign matter sample which has the second capacity may not be detected as a foreign matter (claim 3).

[0011]Foreign matter detection of one foreign matter sample is not carried out by this among groups of a foreign matter sample which have said different capacity, but a sensitivity calibration of said X ray contamination inspection apparatus can be performed so that foreign matter detection of the foreign matter sample of another side may be carried out, and it is possible to perform a sensitivity calibration correctly simpler.

[0012]With transmission X ray, a foreign matter sample which has the first capacity in a foreign matter sample object for sensitivity calibrations of an X ray contamination inspection apparatus which detects a foreign matter contained in an inspected thing, and a foreign matter sample which has the second capacity are made into a lot, and it has it in one (claim 4).

[0013]A foreign matter sample object which equipped one with a foreign matter sample of a lot which has two kinds of different capacity by this can be provided, and it is possible to perform efficiently a sensitivity calibration of said X ray contamination inspection apparatus using this.

[0014]In a foreign matter sample object for sensitivity calibrations of an X ray contamination inspection apparatus which detects a foreign matter contained in an inspected thing with transmission X ray, It has a foreign matter sample of two or more groups depended on two or more foreign matter samples by making into a lot a foreign matter sample which has the first

capacity, and a foreign matter sample which has the second capacity still in one (claim 5).

[0015]A foreign matter sample object which made a lot a foreign matter sample which has two kinds of different capacity by this and which equipped one with two or more groups of two or more foreign matter samples can be provided, and it is possible to perform efficiently a sensitivity calibration of said X ray contamination inspection apparatus to two or more foreign matter samples using this.

[0016]In a group of a foreign matter sample with which said foreign matter sample object was equipped about a foreign matter sample object for sensitivity calibrations of 4 and the X ray contamination inspection apparatus according to claim 5, Said first and the second capacity are chosen so that a foreign matter sample which has the first capacity may be detected as a foreign matter and a foreign matter sample which has the second capacity may not be detected as a foreign matter (claim 6).

[0017]Without carrying out foreign matter detection by this to a sample which has the capacity which can permit an X ray contamination inspection apparatus in a group of said foreign matter sample, Since capacity of a sample in a group of each foreign matter sample is chosen to a sample which has nonpermissible capacity so that foreign matter detection may be carried out, it is possible by using this to perform a more proper sensitivity calibration of an X ray contamination inspection apparatus.

[0018]

[Embodiment of the Invention]Next, based on an accompanying drawing, this invention is explained more to details about an embodiment of the invention.

[0019]Drawing 1 shows the lineblock diagram of the X ray contamination inspection apparatus 1 which can apply the sensitivity calibration method of this invention, and the foreign matter sample object for sensitivity calibrations. An X ray contamination inspection apparatus counters and arranges X ray generating section 2 and X ray line sensor 4 on both sides of the carrying conveyer 3, X ray line sensor 4 picturizes the inspected thing 9 by the X ray image pick-up control section 5, and X line drawing image-processing part 6 carries out image processing of said picturized transmission X ray, and generates the image data of transmission X ray. Image data is inputted into the foreign-matter-detection judgment part 7, the detection judging of the foreign matter contained in an inspected thing is performed, and a result is displayed on the indicator 8. The existence of the foreign matter detection in an inspected thing and the position of a foreign matter can be checked by this.

[0020]Drawing 2 is a figure showing roughly the appearance of the foreign matter sample object concerning a first embodiment of this invention. In drawing 2, 10 is the foreign matter sample object provided with two or more foreign matter samples in one, and 12a and 13a for example, It is a group by a metaled foreign matter sample, and 12a is formed with the ball of the size ($\phi 0.4\text{mm}$) by which foreign matter detection does not have to be carried out with an X ray contamination inspection apparatus, and 13a is formed with the ball of the size ($\phi 0.5\text{mm}$) by which foreign matter detection should be carried out with an X ray contamination inspection apparatus. 12b and 13b are the groups by the foreign matter sample of a stone, 12b is formed with the ball of the size ($\phi 1\text{mm}$) by which foreign matter detection does not have to be carried out with an X ray contamination inspection apparatus, and 13b is formed with the ball of the size ($\phi 2\text{mm}$) by which foreign matter detection should be carried out with an X ray contamination inspection apparatus. 12c and 13c are the groups by the foreign matter sample of glass, 12c is formed with the ball of the size ($\phi 1\text{mm}$) by which foreign matter detection does not have to be carried out with an X ray contamination inspection apparatus, and 13c is formed with the ball of the size ($\phi 2\text{mm}$) by which foreign matter detection should be carried out with an X ray contamination inspection apparatus.

[0021]12d and 13d are the groups by the foreign matter sample of a high-density synthetic resin, 12 d is formed with the cube of the size ($**1\text{mm}$) by which foreign matter detection does not have to be carried out with an X ray contamination inspection apparatus, and 13 d is formed with the cube of the size ($**2\text{mm}$) by which foreign matter detection should be carried out with an X ray contamination inspection apparatus. It is a group according [12e and 13e] to the foreign matter sample of high-density rubber to a pan, 12e is formed with the cube of the size ($**1\text{mm}$)

by which foreign matter detection does not have to be carried out with an X ray contamination inspection apparatus, and 13e is formed with the cube of the size (**2mm) by which foreign matter detection should be carried out with an X ray contamination inspection apparatus. Said each foreign matter sample is fixed or embedded at the substrate 11 of said foreign matter sample object. In addition, it can also have foreign matter samples, such as a bone, a shell, and husks of an egg. The group by said two or more foreign matter samples forms a sequence in the substrate 11 of a foreign matter sample object, and is allocated. The thing of the construction material of the low density in which density differs from said foreign matter sample as much as possible is suitable, for example, low density resin can be used for said substrate 11. Shape may be formed in a sheet shaped other than a tabular thing as shown in drawing 2.

[0022]Said foreign matter sample object 10 is attached to the inspected thing 9, as shown, for example in drawing 3, is laid on the carrying conveyer 3 and conveyed, and dust particle inspection is conducted. Then, the existence of the foreign matter detection and the position of a foreign matter are checked about the group of each foreign matter sample with which said foreign matter sample object 10 was equipped which obtained the analysis image 14 based on the transmission-X-ray data of said inspected thing with the picture monitor of the X ray contamination inspection apparatus 1 as shown in drawing 4, and was attached to said inspected thing. The sample which does not need to be detected for every group of two or more foreign matter samples based on said foreign-matter-detection result, When the sample which should be detected judges whether foreign matter detection is performed correctly and foreign matter detection is not performed correctly, sensitivity settling of an X ray contamination inspection apparatus is performed so that foreign matter detection may be performed correctly. Drawing 4 is showing that foreign matter detection was properly carried out to the sample with larger capacity for two or more samples of every of the foreign matter sample object 10. Then, it lets said dust-particle-inspection thing in which it had said foreign matter sample object 10 again after said sensitivity settling pass to an X ray contamination inspection apparatus, and a foreign-matter-detection result is checked. Drawing 4 shows that foreign matter detection was properly carried out to the sample with larger capacity for two or more samples of every of the foreign matter sample object 10. There are tube voltage of the bulb for X-ray irradiation, the adjustment method by tube current, the adjustment method of the threshold of foreign matter detection, etc. in sensitivity settling of an X ray contamination inspection apparatus.

[0023]

[Effect of the Invention]As mentioned above, according to this invention, the foreign matter sample object provided with the group of a foreign matter sample which has two kinds of different capacity in an X ray contamination inspection apparatus is used, Based on the result which conducted dust particle inspection, the sensitivity calibration of said X ray contamination inspection apparatus can be performed, and it is possible to perform a sensitivity calibration simpler and efficiently.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a lineblock diagram of the X ray contamination inspection apparatus which can apply the sensitivity calibration method of this invention, and the foreign matter sample object for sensitivity calibrations.

[Drawing 2]It is a figure showing roughly the appearance of the foreign matter sample object for sensitivity calibrations of this invention.

[Drawing 3]It is a figure showing roughly the example of use of the foreign matter sample object for sensitivity calibrations of this invention.

[Drawing 4]It is a figure showing the analysis image of the X ray contamination inspection apparatus which can apply the sensitivity calibration method of this invention, and the foreign matter sample object for sensitivity calibrations.

[Explanation of an encoder signal]

1 X ray contamination inspection apparatus

2 X ray generating section

3 Carrying conveyer

4 X ray line sensor

5 X ray image pick-up control section

6 X line drawing image-processing part

7 Foreign-matter-detection judgment part

8 Indicator

9 Inspected thing

10 X ray foreign matter sample object

11 The substrate of an X ray foreign matter sample object

12a-12e Foreign matter sample

13a-13e Foreign matter sample

The foreign-matter-detection analysis picture of the 13a'-13e' foreign matter samples 13a-13e

14 The analysis image of X ray dust particle inspection

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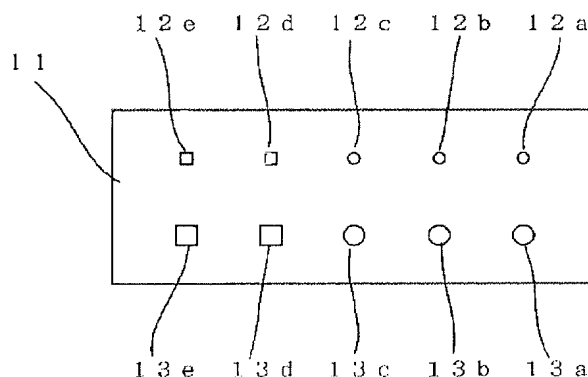
(54) 【発明の名称】 X線異物検査装置の感度校正方法及び感度校正用異物試料体

(57) 【要約】

【課題】 異物試料を用いたX線異物検査装置の感度校正作業を効率的に行うことができる校正方法と、感度校正用異物試料体を提供することである。

【解決手段】 透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正方法において、第一の容積を有する異物試料と第二の容積を有する異物試料を一組として、一体的に備えた異物試料体を用いて、該異物試料体を添えた前記検査物に対してX線照射し、その透過X線像の画像データに基づいて出力される、前記異なる容積を有するそれぞれの異物試料に対する異物検出信号により、前記X線異物検査装置の感度校正を行う。

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【特許請求の範囲】

【請求項1】 透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正方法において、第一の容積を有する異物試料と第二の容積を有する異物試料を一組として、一体的に備えた異物試料体に対して、X線照射し、その透過X線像の画像データに基づいて出力される、前記異物試料に対する異物検出信号により、前記X線異物検査装置の感度校正を行うことを特徴とするX線異物検査装置の感度校正方法。

【請求項2】 透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正方法において、それぞれ第一の容積を有する異物試料と第二の容積を有する異物試料を一組とした、複数の異物試料による複数の組を、さらに一体的に備えた異物試料体に対して、X線照射し、その透過X線像の画像データに基づいて出力される、前記複数の組の異物試料に対する異物検出信号により、前記X線異物検査装置の感度校正を行うことを特徴とするX線異物検査装置の感度校正方法。

【請求項3】 前記異物試料体に備えられた異物試料の組において、第一の容積を有する異物試料は異物として検出され、第二の容積を有する異物試料は異物として検出されないように、前記X線異物検査装置の感度校正を行うことを特徴とする請求項1及び請求項2に記載のX線異物検査装置の感度校正方法。

【請求項4】 透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正用異物試料体において、第一の容積を有する異物試料と第二の容積を有する異物試料を一組として、一体的に備えることを特徴とするX線異物検査装置の感度校正用異物試料体。

【請求項5】 透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正用異物試料体において、第一の容積を有する異物試料と第二の容積を有する異物試料を一組として複数の異物試料による複数の組の異物試料をさらに一体的に備えることを特徴とするX線異物検査装置の感度校正用異物試料体。

【請求項6】 前記異物試料体に備えられた異物試料の組において、第一の容積を有する異物試料は異物として検出され、第二の容積を有する異物試料は異物として検出されないように、前記第一及び第二の容積を選択することを特徴とする請求項4及び請求項5に記載のX線異物検査装置の感度校正用異物試料体。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、透過X線の検出によって被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正方法及び前記感度校正用異物試料体に関する。

【0002】

【従来の技術】従来から、食品や医薬品に含まれる異物

(金属、石、ガラス、合成樹脂、骨、ゴム等)の検出に、X線異物検査装置が用いられている。また、前記X線異物検査装置は、被検査物にX線が照射され、その透過X線の画像データに基づいて、前記被検査物に含まれる異物の検出を行うものである。また、前記X線異物検査装置はラインセンサを備えることによって、搬送装置上の被検査物の透過像を検出することができ、前記被検査物に含まれる異物が検出されれば、搬送装置上から排除することを行っている。

【0003】従来のX線異物検査装置は、例えば搬送装置上の被検査物を透過したX線をラインセンサによって撮像し、前記撮像によって得られる画像データに基づいて、しきい値との比較判定処理を行うことで異物検出を行っている。また、被検査物の異物検査に対して、事前に感度校正を行っている。該感度校正の方法として、被検査物を、前記X線異物検査装置に通してX線異物検査装置の感度校正を自動で行う方法と、異物試料を混入した被検査物を、前記X線異物検査装置に通してX線異物検査装置の感度校正を手動で行う方法がある。また、異物試料を用いた手動の方法として、複数の異物試料を混入させた複数の被検査物を用意して、前記複数の被検査物毎に該被検査物をX線異物検査装置に通して、その都度、感度校正を行っている。また、前記X線異物検査装置では、使用中においてX線照射量の変動、その他により、異物検出感度の変動が生じることがある。そこで、使用状態の途中においても、異物試料を混入した被検査物をX線異物検査装置に通して、その感度校正を行っている。

【0004】

【発明が解決しようとする課題】前述したように、従来のX線異物検査装置では、異物試料を用いて感度校正を手動で行う場合に、使用前と使用中において、異物試料毎に異物試料を被検査物に混入したものをX線異物検査装置に通して、その都度、感度校正を行う必要があるため、校正作業に手間がかかるとともに、時間が必要とし、効率的な校正作業が行えないという問題点がある。

【0005】そこで、本発明は、このような従来技術の問題点を解決し、異物試料を用いたX線異物検査装置の感度校正作業を効率的に行うことができる校正方法と、感度校正用異物試料体を提供することを目的とする。

【0006】

【課題を解決するための手段】透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正方法において、第一の容積を有する異物試料と第二の容積を有する異物試料を一組として、一体的に備えた異物試料体に対して、X線照射し、その透過X線像の画像データに基づいて出力される、前記異物試料に対する異物検出信号により、前記X線異物検査装置の感度校正を行うことを特徴とする(請求項1)。

【0007】これにより、2種類の異なる容積を有する

一組の異物試料に対して、同時に異物検査し、前記各試料毎の異物検出結果に基づいて、前記X線異物検査装置の感度校正を行うことができ、感度校正を効率的に行うことが可能である。

【0008】そして、透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正方法において、それぞれ第一の容積を有する異物試料と第二の容積を有する異物試料を一組とした、複数の異物試料による複数の組を、さらに一体的に備えた異物試料体に対して、X線照射し、その透過X線像の画像データに基づいて出力される、前記複数の組の異物試料に対する異物検出信号により、前記X線異物検査装置の感度校正を行うことを特徴とする（請求項2）。

【0009】これによって、さらに2種類の異なる容積を有する異物試料を一組とした、複数の異物試料による複数の組を、同時に異物検査し、前記複数の組の各試料毎の異物検出結果に基づいて、前記X線異物検査装置の感度校正を行うことができ、感度校正をより効率的に行うことが可能である。

【0010】そして、請求項1及び請求項2に記載のX線異物検査装置の感度校正方法について、前記異物試料体に備えられた異物試料の組において、第一の容積を有する異物試料は異物として検出され、第二の容積を有する異物試料は異物として検出されないように、前記X線異物検査装置の感度校正を行うことを特徴とする（請求項3）。

【0011】これにより、前記異なる容積を有する異物試料の組の内、一方の異物試料が異物検出されず、他方の異物試料が異物検出されるように前記X線異物検査装置の感度校正を行うことができ、感度校正をより簡便で且つ正確に行うことが可能である。

【0012】さらに、透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正用異物試料体において、第一の容積を有する異物試料と第二の容積を有する異物試料を一組として、一体的に備えることを特徴とする（請求項4）。

【0013】これにより、2種類の異なる容積を有する一組の異物試料を、一体に備えた異物試料体を提供することができ、これを用いて前記X線異物検査装置の感度校正を効率的に行うことが可能である。

【0014】また、透過X線によって、被検査物に含まれる異物の検出を行うX線異物検査装置の感度校正用異物試料体において、第一の容積を有する異物試料と第二の容積を有する異物試料を一組として複数の異物試料による複数の組の異物試料をさらに一体的に備えることを特徴とする（請求項5）。

【0015】これにより、2種類の異なる容積を有する異物試料を一組とした、複数の異物試料の複数の組を一体に備えた異物試料体を提供することができ、これを用いて複数の異物試料に対する前記X線異物検査装置の感

度校正を効率的に行うことが可能である。

【0016】さらに、4及び請求項5に記載のX線異物検査装置の感度校正用異物試料体について、前記異物試料体に備えられた異物試料の組において、第一の容積を有する異物試料は異物として検出され、第二の容積を有する異物試料は異物として検出されないように、前記第一及び第二の容積を選択することを特徴とする（請求項6）。

【0017】これによって、前記異物試料の組において、X線異物検査装置が許容できる容積を有する試料に対して、異物検出しないで、許容できない容積を有する試料に対して、異物検出するように、それぞれの異物試料の組における試料の容積を選択しているので、これを用いることによって、X線異物検査装置のより適正な感度校正を行うことが可能である。

【0018】

【発明の実施の形態】次に、添付図面に基づいて、本発明の実施の形態について本発明をより詳細に説明する。

【0019】図1は、本発明の感度校正方法及び感度校正用異物試料体を適用することができるX線異物検査装置1の構成図を示す。X線異物検査装置はX線発生部2とX線ラインセンサ4とを搬送コンベア3を挟んで対向して配置し、X線ラインセンサ4は、X線撮像制御部5により被検査物9の撮像を行い、X線画像処理部6は前記撮像した透過X線を画像処理して、透過X線の画像データを生成する。また、画像データは異物検出判定部7に入力され、被検査物に含まれる異物の検出判定を行い、結果が表示部8に表示される。これによって被検査物中の異物検出の有無と異物の位置を確認することができる。

【0020】図2は、本発明の第一の実施の形態にかかる異物試料体の外観を概略的に示す図である。図2において、10は、複数の異物試料を一体的に備えた異物試料体であり、12a及び13aは例えば、金属の異物試料による組であり、12aはX線異物検査装置により異物検出されなくてもよい大きさ（ $\phi 0.4\text{mm}$ ）の球により形成され、13aはX線異物検査装置により異物検出されるべき大きさ（ $\phi 0.5\text{mm}$ ）の球により形成されている。また、12b及び13bは例えば、石の異物試料による組であり、12bはX線異物検査装置により異物検出されなくてもよい大きさ（ $\phi 1\text{mm}$ ）の球により形成され、13bはX線異物検査装置により異物検出されるべき大きさ（ $\phi 2\text{mm}$ ）の球により形成されている。また、12c及び13cは例えば、ガラスの異物試料による組であり、12cはX線異物検査装置により異物検出されなくてもよい大きさ（ $\phi 1\text{mm}$ ）の球により形成され、13cはX線異物検査装置により異物検出されるべき大きさ（ $\phi 2\text{mm}$ ）の球により形成されている。

【0021】また、12d及び13dは例えば、高密度

合成樹脂の異物試料による組であり、12dはX線異物検査装置により異物検出されなくてもよい大きさ(□1mm)の立方体により形成され、13dはX線異物検査装置により異物検出されるべき大きさ(□2mm)の立方体により形成されている。さらに12e及び13eは例えば、高密度ゴムの異物試料による組であり、12eはX線異物検査装置により異物検出されなくてもよい大きさ(□1mm)の立方体により形成され、13eはX線異物検査装置により異物検出されるべき大きさ(□2mm)の立方体により形成されている。前記各異物試料は前記異物試料体の基材11に固定または埋め込まれている。また、その他にも、硬骨、貝殻、卵の殻等の異物試料も備えることができる。また、前記複数の異物試料による組は異物試料体の基材11に列を形成して配設されている。前記基材11は、前記異物試料とはできるだけ密度の異なる低密度の材質のものが適しており、例えば低密度樹脂を採用することができる。また、形状は図2に示すような板状のもの他にシート状に形成してもよい。

【0022】さらに、前記異物試料体10は、例えば図3に示すように、被検査物9に添えて、搬送コンベア3上に載置して搬送され、異物検査が行われる。続いて、図4に示すようにX線異物検査装置1の画像モニターで、前記被検査物の透過X線データに基づく解析画像14を見て、前記被検査物に添えられた、前記異物試料体10に備えられた各異物試料の組について、その異物検出の有無と異物の位置を確認する。前記異物検出結果に基づいて、複数の異物試料の組毎に、検出されなくてもよい試料と、検出されるべき試料が、異物検出が正しく行われているかどうかの判断を行い、異物検出が正しく行われていないときには、異物検出が正しく行われるようにX線異物検査装置の感度調整を行う。また、図4は、異物試料体10の複数の試料毎に容積の大きい方の試料に対して、適正に異物検出されたことをしめしている。続いて、前記感度調整後に再度、前記異物試料体10が備えられた前記異物検査物をX線異物検査装置に通して、異物検出結果の確認を行う。図4は、異物試料体10の複数の試料毎に容積の大きい方の試料に対して、適正に異物検出されたことを示している。また、X線異

物検査装置の感度調整には、X線照射用の管球の管電圧や管電流による調整方法及び異物検出のしきい値の調整方法等がある。

【0023】

【発明の効果】以上のように、本発明によれば、X線異物検査装置において、2種類の異なる容積を有する異物試料の組を備える異物試料体を用いて、異物検査した結果に基づいて、前記X線異物検査装置の感度校正を行うことができ、感度校正をより簡便且つ効率的に行うことが可能である。

【図面の簡単な説明】

【図1】 本発明の感度校正方法及び感度校正用異物試料体を適用することができるX線異物検査装置の構成図である。

【図2】 本発明の感度校正用異物試料体の外観を概略的に示す図である。

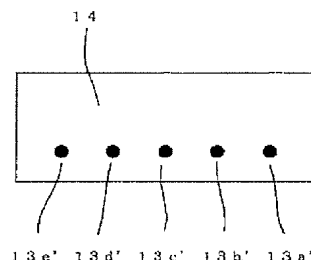
【図3】 本発明の感度校正用異物試料体の使用例を概略的に示す図である。

【図4】 本発明の感度校正方法及び感度校正用異物試料体を適用することができるX線異物検査装置の解析画像を示す図である。

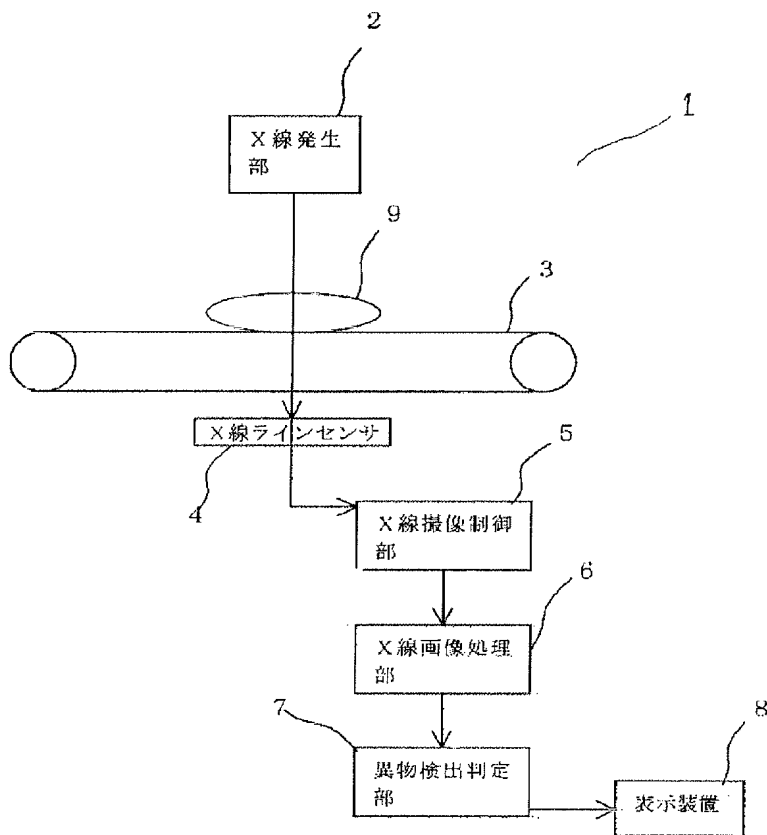
【付号の説明】

- 1 X線異物検査装置
- 2 X線発生部
- 3 搬送コンベア
- 4 X線ラインセンサ
- 5 X線撮像制御部
- 6 X線画像処理部
- 7 異物検出判定部
- 8 表示部
- 9 被検査物
- 10 X線異物試料体
- 11 X線異物試料体の基材
- 12a~12e 異物試料
- 13a~13e 異物試料
- 13a'~13e' 異物試料13a~13eの異物検出分析画像
- 14 X線異物検査の解析画像

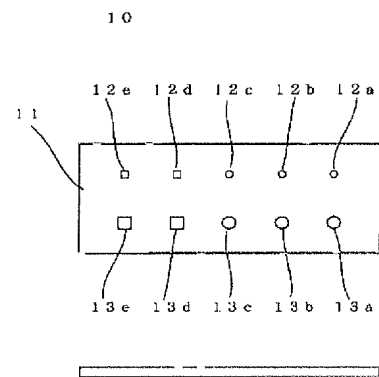
【図4】



【図1】



【図2】



【図3】

